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Teacher Education

The Mathematics Program

MARCH
1954

ILLINOIS STATE NORMAL UNIVERSITY

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TEACHER EDUCATION

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DEDICATION

To Professor Clifford Newton Mills, for twenty-nine years head of the Department of Mathematics at Illinois State Normal University, a brilliant mathematician, an inspirational teacher, an author and a speaker of note, a wise counselor and good friend, this issue of *Teacher Education* is dedicated by the mathematics staff.

CLIFFORD NEWTON MILLS

EDITH IRENE ATKIN*

It was a fortunate day for mathematics at Illinois State Normal University when Clifford Newton Mills was born to Oliver Perry Mills and Nancy Elizabeth Beeson Mills in Carlos, Indiana.

After many years of fine training and of rich experience, Professor Mills was, in 1925, invited by President David Felmley to become head of the Department of Mathematics at Illinois State Normal University. As the University has grown, Professor Mills has expanded the number and the content of the courses offered, until they now include courses leading to the master's degree; and to carry the increasing load, he has brought outstanding teachers to join the staff, which numbered three in 1925 and now numbers eight. His interest in mathematics covers a wide range. One class period he may be found instructing an elementary group in the teaching of primary arithmetic, and the next a graduate class in advanced projective geometry.

Realizing the need for a club to draw together superior mathematics students for programs on topics supplementary to class work and for social times, he took the initiative in the organization of the Euclidean Circle, which after several years was invited to become the Illinois Alpha Chapter of the national honorary mathematics fraternity, Kappa Mu Epsilon. Since its organization in 1934, Professor Mills has served as sponsor or corresponding secretary with the exception of one year when he was on leave of absence.

Particularly to mathematics majors his teaching has been a challenge and an inspiration. Alumni and present students talk about his "power problems"—difficult problems the solutions of which require a show of real mathematical ability. To Professor Mills himself, a new or a very difficult problem in advanced mathematics is always a delight, and, though hours of work are required, he always finds the solution or proves that one is impossible.

Clifford Newton Mills received his elementary schooling in Carlos, Indiana, and, after graduating from the high school in Hayden, Indiana, taught in the rural schools of Jennings County.

His college training started at Franklin College, Indiana, where he secured a Bachelor of Science degree. Thereafter, he taught mathematics in the Franklin High School for two and a half years. Then followed work at Indiana University leading to a master's degree in 1915. In 1929-30 he studied at the University of Michigan, and in 1936-37 at the University of Wisconsin which granted him a Doctor of Philosophy degree in 1939 after the completion of his dissertation.

It is significant that the mathematics departments of these three universities recognized his outstanding ability and gave him remunerative teaching assignments in connection with his course work. At Indi-

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ana he was a Teaching Fellow; at Michigan, a half-time assistant; and at Wisconsin, acting associate professor of the teaching of mathematics.

His full-time college-mathematics positions include three years as head of the department at Highland College, Kansas; five and a half years in the mathematics department at South Dakota State College at Brookings, where his work was interrupted by World War I when he served as a teacher of mathematics at the Officers' Training School at Camp Taylor from July, 1918, to November, 1918; four years at Heidelberg College, Tiffin, Ohio, as head of the department; two years as professor of mathematics at Northern State Teachers College at Aberdeen, South Dakota; and since September, 1925, as head of the Illinois State Normal University Department of Mathematics. During the summer of 1952 he was guest professor of the teaching of mathematics at Colorado State College at Greeley.

There are a number of books of which Professor Mills is author or collaborator:

Elementary Mathematics for Engineers (New York: D. Van Nostrand Company, 1916).

Introduction to Analytical Geometry and Calculus (Philadelphia: P. Blakiston's Sons and Co., 1922).

Unit Mastery Arithmetics (New York: B. H. Sanborn & Company, 1932), a three-book series with John C. Stone as coauthor.

Unit Mastery Mathematics (New York: B. H. Sanborn & Company, 1934), a three-book series for junior high schools with John C. Stone and Virgil S. Mallory as coauthors.

Plane Trigonometry (New York: Scott, Foresman and Company, 1937; revised, 1947), a text in which he and two colleagues, Edith I. Atkin and Elinor B. Flagg, collaborated.

Arithmetic for Teacher Training Classes (New York: Henry Holt and Company, 1949), a text with E. H. Taylor as coauthor.

Professor Mills, furthermore, has a manuscript ready for publication tentatively entitled *Analytic Geometry.* He has also contributed articles on mathematics to various magazines and lectured to educational organizations.

The organizations to which Professor Mills belongs reveal his interests and activities. Among them are the Mathematical Association of America, which he served from 1923-28 as one of the associate editors of the official journal, *The American Mathematical Monthly;* the Illinois Section of the Mathematical Association of America, in which for about ten years he served in the dual capacity of recording and corresponding secretary; the Central Association of Science and Mathematics Teachers, which he served from 1925-31 as the editor of the Problem Department of the official journal, *School Science and Mathematics*; the National Council of Teachers of Mathematics; the Illinois Council of Teachers of Mathematics, of which he was president for one

year; the two national honorary fraternities, Kappa Mu Epsilon and Kappa Phi Kappa; the National Education Association; the Illinois Education Association; the Second Presbyterian Church of Bloomington; the Thirty-Second Degree Masons; and the Optimist International.

The former Erma Alice Davis of Highland, Kansas, a graduate in Home Economics from South Dakota State College, is the wife of Professor Mills. One index of the happy home life created by this couple is found in their three very fine children—two sons and a daughter—and their mutual interest and devotion. Thomas Perry has a B.S. degree in pharmacy from South Dakota State College and now owns a drug store in Sioux Falls, South Dakota. Robert Newton completed a five-year program at the University of Minnesota leading to degrees in electrical engineering and business administration, and now has charge of the personnel work in the selection of trainees for the Cincinnati plant of the General Electric Company, jet engine division. Alice Elizabeth, an attractive, talented young woman, is a senior in pharmacy at South Dakota State College.

Professor and Mrs. Mills are a charming host and hostess; the mathematics staff, members of Kappa Mu Epsilon, and many other friends will always remember with pleasure the delightful dinners and parties in the Mills home.

And what will Professor Mills do when he retires? One thing is certain, life for him will never mean boredom. He has too many interests. He likes music and has a good tenor voice; his friends hope he will resume the playing of the violin. His apple butter, hominy, and candy are excellent products of his cooking skill. He is a good gardener and a handy man with tools around the home. His hobbies are hunting and fishing. During the recent holidays he did some deep-sea fishing off the coast of Florida.

His retirement will not mean that he will become divorced from mathematics. He will doubtless be working on a revision of his textbooks, preparing a new manuscript, an article for a mathematics magazine, or an address, or working out the solution of some difficult problem which has eluded one of his former students or other friends.

The deep abiding interest of Professor and Mrs. Mills will always be in the welfare of their children, and, when release from University duties comes, it will permit them to visit their children frequently.

The mathematics staff salutes you, Professor Mills, congratulates you on your very fine achievements, and wishes you many more happy years in carrying out your multiplicity of interests.

MATHEMATICS AT ILLINOIS STATE NORMAL UNIVERSITY

The past—the present—toward the future

CLIFFORD N. MILLS*

Michel Chasles once said: "History shows that those heads of empires who have encouraged the cultivation of mathematics, the common source of all the exact sciences, are also those whose reigns have been the more brilliant and whose glory is the most durable."

In 1857 when Illinois State Normal University was established under the leadership of President C. E. Hovey, the field of mathematics was given prominent attention. The courses offered included higher mathematics, algebra, geometry, and arithmetic. The term "higher mathematics" meant some phase of higher arithmetic and algebra. The study of arithmetic was dominant.

During the seventies under the leadership of President Edwin C. Hewett, the study of arithmetic turned toward the serious consideration of methods of instruction. He recognized, however, the significance of numbers as one of the main agents helpful in gaining a knowledge of one's environment. He was a firm believer in oral arithmetic as a means of developing the child's alertness as well as the child's ability to adapt himself to quantitative thinking. The culmination of Hewett's philosophy was evidenced in his books, published in 1896 after he had given up the duties of president.

The importance of arithmetic was further stressed by Professor John C. Cook, who later became president of Illinois State Normal University. In his day the influence of the McMurrys and DeGarmo, who visualized the teaching process in terms of Herbartian philosophy, was evident. President Cook's books had much influence on the teaching of arithmetic.

In 1890 David Felmley came to Illinois State Normal University as Professor of Mathematics, and in 1900 he became president of the University. Arithmetic took on a new life, for Mr. Felmley was a firm believer in rigid discipline and always searched for exactness in number expression. He stressed the value of oral and mental arithmetic. He did not tolerate looseness of expressions when dealing with number situations. He cherished a good argument and delighted in seeing his students develop into keen thinkers.

About the turn of the century a new philosophy regarding mathematics was taking root in America. This new philosophy was the result of the Klein movement in Germany, the Perry movement in England, and the teaching of Professor E. H. Moore of the University of Chicago. The philosophy of Professor John Dewey also played an important role. Illinois State Normal University was not negligent in recognizing the value of the new movement. The training of teachers for the

* Professor of Mathematics

secondary schools was beginning to receive much attention. In 1901 Mr. George H. Howe was appointed head of the Department of Mathematics. Even though his main interest was in the field of arithmetic, he expanded collegiate mathematics to include courses through analytic geometry. Professor Howe was considered somewhat conservative in his teaching; he carried on the traditional attitude toward the philosophy of exactness in mathematical thought. He was an excellent teacher and was greatly loved by all his students.

During the regimes of President Cook and President Felmley, one must mention the names of Miss Mary Hartman and Miss O. Lillian Barton, who had effective roles in the teaching of arithmetic, algebra, and geometry. Miss Barton later became Dean of Women. Since her retirement she has been living in Normal.

The recommendations of national committees on the teaching of arithmetic were influential in bringing about an expansion of courses in the academic and professional subjects. In 1909 Miss Edith I. Atkin came to Illinois State Normal University as a teacher of mathematics. Her work was very influential in promoting a creative interest in higher mathematics and its applications. After studying at Columbia University with outstanding teachers, she was instrumental in furthering the professional phase of the mathematics program. Her keenness of insight and her enthusiasm were admired by all the students in her classes. Her philosophy was an inspiration to all persons with whom she worked. No task was too little or too hard for her; she met every challenge. Miss Atkin retired in 1944 and continues to live in Normal.

In 1923 professional courses in the history of mathematics and the teaching of secondary mathematics were offered. The academic courses included one quarter in differential calculus, one quarter in integral calculus, and one quarter in introduction to differential equations. In 1925 the course in the history of mathematics was expanded. In 1923 Mr. A. W. Philips, who was especially interested in the professional courses in arithmetic came to Illinois State Normal University. In 1924 he accepted a position at Emporia Teachers College, Kansas. During this period Mr. Lewis H. Bowyer taught for two years, including summer sessions. He accepted a position in one of the Chicago high schools. Now, after retirement, he lives in Arizona.

The first extra-curricular activity sponsored by the staff was the mathematics club called the Euclidean Circle. The purpose of the club was to create interest in and to discuss topics which supplemented the regular classroom treatment of mathematics. The club was abandoned in 1934 and became the charter-member group for the installation of Kappa Mu Epsilon, the national mathematics fraternity. The writer was for one year the national treasurer of the fraternity. Kappa Mu Epsilon has functioned effectively in the teaching of mathematics. Its members have been faithful in attendance at Homecoming breakfasts and at the anniversary banquets. The chapter is well represented over the state of Illinois and throughout the United States by its 396 members.

In 1925 the writer came to Illinois State Normal University as head of the Department. In 1926 the third quarter of calculus was offered. In 1927 the course in the teaching of mathematics was expanded into two courses, one for the teaching of junior-high-school mathematics and the other for the teaching of senior-high-school mathematics.

In 1932 the academic courses were expanded to include advanced calculus, mathematics of finance, statistics, college geometry, projective geometry, and advanced differential equations. During the next few years the interest of the staff centered around reorganization of courses and improvement of instruction. In 1945 the course called Survey in Mathematics was offered by Dr. Bjarne Ullsvik, who had joined the staff in that year.

From 1925 to the present time Miss Elinor Flagg has been a very valuable member of the staff, teaching in the fields of arithmetic, junior-high-school mathematics, and senior-high-school mathematics, as well as teaching professional courses. At the present time she is devoting the major portion of her efforts to the field of arithmetic.

Graduate work in mathematics was first offered in 1945, the courses being taught by Dr. Bjarne Ullsvik, Dr. Clyde McCormick, and the writer. At the present time Dr. Ullsvik devotes only half of his time to teaching because he is administrative assistant to the President. During the past two years Dr. T. E. Rine has been assigned to teach some of the graduate courses.

At the present time other members of the staff are Mr. Douglas Bey, who teaches half time in the University High School and serves as dean of boys there; Mr. Francis Brown, who has been secured to further the teaching of junior-high-school mathematics; and Mr. Willam Popejoy, whose main assignment is supervision in the University High School. Last year the Department lost a valuable teacher, Miss Edna Norskog, when she passed on to her reward. She was a very efficient supervisor. When Dr. A. H. Larsen came to Illinois State Normal University, he was a member of the mathematics staff. When he accepted administrative assignments, he gave up his teaching in the Department; now he is academic Dean of the University. However, he is willing to teach courses in mathematics when the occasion arises.

From the teacher-training point of view the duties of the mathematics staff are unique. Besides teaching the regular collegiate classes, each member is assigned supervision duties in connection with student teachers in the University High School. This arrangement assures that student teachers are well trained before they assume regular duties in the teaching profession.

The enrollment in the Department of Mathematics is increasing steadily. Last year, at the Annual Mathematics Conference, Professor John R. Clark of Columbia University said: "Your institution is second to none relative to the number of students preparing specifically to teach secondary-school mathematics."

In looking toward the future, the Department staff hopes that the offerings in its teacher-training program will be strengthened and that further interest in improving the teaching of mathematics will be created. This is a scientific age, an age in which mathematics is of paramount importance to future development and progress. Mathematics is the keystone of progress in the modern world. The mathematics staff proudly watches its graduates as they take their places in the world of activity and set forth the philosophy that mathematics is worthwhile.

GRADUATE PROGRAM IN MATHEMATICS

BJARNE R. ULLSVIK*

The graduate-school program in the Department of Mathematics at Illinois State Normal University has a two-fold objective—to provide students with additional academic background in order to increase their understanding of topics usually taught on the elementary and secondary level; and to acquaint them with trends, theories of learning, and research related to the actual teaching process. Primary emphasis is given to the secondary level because of the number of graduate students interested in secondary teaching, but increasing concern is being given to a graduate program for teachers of arithmetic.

The academic courses given on the graduate level can be grouped under five categories as follows:

Algebra:
- Theory of Equations
- Mathematics of Finance
- Mathematics of Statistics

Geometry:
- Projective Geometry
- Field Work in Mathematics

Analysis:
- Linear Differential Equations
- Applied Differential Equations

History:
- History of Mathematics

Teaching Problems:
- Special Problems in the Teaching of Arithmetic
- Special Problems in the Teaching of High-School Algebra
- Special Problems in the Teaching of High-School Geometry
- Teaching and Supervision of Secondary-School Mathematics
- Thesis or Research Project

The above courses are usually given throughout one academic year and one summer session. In this way a graduate student can secure the necessary twenty elective semester hours of credit, besides

* Professor of Mathematics

those twelve semester hours of credit required in Education, to qualify for a master's degree in secondary teaching with specialization in mathematics. Included in these twenty semester hours of credit is the thesis or research project which can vary from two to four semester hours of credit. Evidence of the kind of theses and research projects that have been prepared by graduate students specializing in mathematics and culminating in master's degrees can be found on pages 14 to 17. The academic courses are taught with special emphasis on the objective of providing for an increasing understanding of the content characterizing secondary-school mathematics in the belief that "teachers will tend to teach as they were taught." All members of the Department have had substantial experience on both the elementary and secondary level; as a result the academic teaching is pointed with illustrations directed toward the enrichment and understanding of elementary- and secondary-school mathematics. Such consideration has long been a chief objective of the Department, and staff members have been selected with primary emphasis upon the need to provide close articulation between teacher preparation and effective classroom teaching.

In order to enter the Graduate School to specialize in mathematics, each student must present his credentials for evaluation by the graduate council, of which the head of the Department of Mathematics is a member. Unless the applicant has met the undergraduate requirement for a major in mathematics, certain deficiencies must necessarily be met prior to full admittance to the Graduate School with permission to specialize in the field of mathematics. A student's major professor is recommended by the head of the Department of Mathematics to the Dean of the Graduate School after consultation with the student.

The thesis topic of each graduate student is evolved from the experience and wishes of the student with judgment exercised by his major professor as to the feasibility of his chosen thesis within the time limit available to the student. This thesis is regarded as the best single investigation that the student has ever made and is directed toward providing a contribution to the literature of mathematics. The major professor recognizes the need for selection of a topic which provides for a complete unit of investigation but which will not become so involved as to jeopardize the possibility of having the graduate student complete his master's degree within the time limit available to him.

The courses under the category "Teaching Problems" should be considered as professionalized subject matter rather than as solely academic, for they are largely concerned with the teaching and learning process. These courses are designed to acquaint the graduate student with the recent developmental history of the teaching of arithmetic, high-school algebra, and high-school geometry, with special reference to suggested solutions of problems in each of the areas. Much emphasis is given to the national committee reports and to references in periodicals especially pertinent to teaching problems where solutions are neither evident nor completely agreed upon.

Most graduate students come to realize that there are many instances in which there is no "right way" to teach certain concepts, and recognize that each teacher should have available various techniques in order to provide for the individual differences that exist in the classroom. Such consideration creates a need for data on school population, on the use of multi-sensory aids, and on the merits of prevalent curricular patterns, as well as for recognition of characteristics associated with gifted and retarded students. Each of these special-problems courses includes the usual course content of elementary- and/or secondary-school mathematics and is a search for the latest recommended suggestions for teaching meaning (rather than mere manipulation), development of basic number concepts, planning of a sequential program, importance of drill or practice, interpretation of data, critical thinking, problem solving, and similar concepts considered both crucial and difficult to teach.

Each of the special problems courses requires a term paper, which usually suggests the research project or thesis. Such term papers are the result of class discussions and readings as to recent recommendations and investigations on the problems affecting the teaching of either, or both, elementary- and secondary-school mathematics. These term papers provide an opportunity to get "a feel" of the research process and to determine whether or not a particular inclination toward an investigation has the possibilities required of a thesis.

Much emphasis is given to the evaluation of the objectives of secondary-school mathematics with special reference to the creation of evaluation instruments for the teaching of difficult-to-measure objectives to which teachers usually give lip service but which they rarely attempt to measure objectively. Such development is enlightening as to the difficulties associated with teaching for an objective and creates a need for tangible evidence as to the success of a teaching unit. The ability to choose pertinent standardized tests and also to recognize the implications of such tests for teaching is a necessary part of a modern teacher's equipment; furthermore the ability to create valid tests on small teaching units can do much to vitalize and pinpoint a teaching procedure.

The graduate program in mathematics at Illinois State Normal University is of recent origin, having begun in the fall of 1945, and the Department is proud of those graduate students who have secured their master's degrees with specialization in mathematics. These students are now located in many areas of the midwest. Correspondence indicates that each is increasing the enthusiasm for meaningful teaching of mathematics with a resulting betterment of pupil understanding.

The graduate program of the Department of Mathematics is solely concerned with the preparation of improved teachers of mathematics. This hopeful objective is sought for through the medium of courses designed to meet the needs of teachers by a mathematics staff singularly devoted to the promotion of excellent teaching of mathematics in the elementary and secondary schools.

RESEARCH IN THE TEACHING OF MATHEMATICS

WILLIAM D. POPEJOY*

The following is a summary of the work in eleven individual theses dating from 1948 through 1953. No attempt has been made to evaluate or criticize, and only those findings reported in the theses are used. The number in parentheses appearing hereafter following the name of a person refers to the bibliographical listing of the theses at the end of this article. Two copies of each of the theses are available in the Milner Library of Illinois State Normal University. The original may be used at any time in the Library; the other copy may be borrowed under the usual terms of interlibrary loan.

Teaching critical thinking in the ninth grade—The theses of Richard Harder (5) and Edward Whitmore (10) report the results of attempting to teach units on critical thinking in ninth-grade classes. Both studies covered three weeks of class time. The authors gave pretests as well as tests at the conclusion of the unit. Mr. Whitmore gave additional tests four weeks after the completion of the unit; Mr. Harder gave them five months after the completion of the unit. Computed t-ratios were significant beyond the one per cent levels in both studies. Questionnaires for student comments were given to the students at the completion of the unit.

Mr. Harder reported the following conclusions:

> It is possible to improve the ability of ninth-grade general mathematics students of the type used in the study to think critically. This improvement was retained for a period of at least five months. The students were receptive to the materials. It seems probable from the evidence that much more could be done with the teaching of critical thinking than has been done in the past.

Mr. Whitmore reported:

> From the statistical evaluation and the student evaluation, the following conclusions were reached:
>
> (a) It is possible to improve the ability of ninth-grade students to think critically.
>
> (b) This ability to think critically was retained for at least a period of four weeks.
>
> (c) The students enjoyed a unit of this type and seemed to feel that they had derived benefit from it.

Mathematics in ninth-grade general science—An experimental study by Marion Thomas (9) was conducted to determine if general science can be taught to increase understanding of mathematics without loss to the scientific principles involved. Control and experimental groups were formed and data recorded on the two groups. Fifty-eight

* Instructor in Mathematics

pairs were matched. The results indicate that mathematical understandings can be emphasized in ninth-grade general science without significant loss to the scientific learnings.

Predicting success in elementary algebra—In a study by Ralph Johnson (6) the predictive values of the *SRA Primary Mental Abilities* battery and the *Iowa Algebra Aptitude Test* were compared. Success in algebra was determined by using the first semester grades given by the teacher to seventy-three University High School students for whom data were available. The *Iowa Algebra Aptitude Test* yielded a correlation of 0.53 and the total score on the *SRA* battery gave a correlation of 0.52 with teacher grades. Part scores from the *SRA* battery for Reasoning, Word Fluency, and Verbal Meaning yielded correlations of 0.43 to 0.46 with grades given by the teacher. The Space Ability and the Number Ability tests gave low correlations with teacher marks. The highest multiple correlation (0.65) came from a combination of the *Iowa Algebra Aptitude Test*, and the Word-Fluency and the Reasoning tests of the *SRA* battery. Since this correlation is higher than the ones for the total scores of either test, Mr. Johnson suggests that this combination of scores is particularly useful for the purposes of guidance.

Algebraic vocabulary vs. success in mathematics—A statistical study of 173 elementary algebra and 88 geometry students from four high schools is reported in the thesis of Edwin Wilde (11). A test to measure "technical algebraic vocabulary" was constructed by the author, and the results were compared with teachers' marks and, for the algebra students, with the scores on the *Breslich Algebra Survey Test.* Eta coefficients were computed and corrected for the use of limited sample and when necessary for broad categories. The results yielded the following conclusions: (a) a moderate-to-high relationship between "technical algebraic vocabulary" and success in algebra; (b) a low relationship between "technical algebraic vocabulary" and success in geometry.

A second year of general mathematics—General mathematics has experienced a tremendous increase in popularity in recent years. The literature has pointed to a need for a second year of general mathematics to follow the usual course now offered in many secondary schools. William Posorske (8) in his study listed a two-fold purpose:

> to present an organization of suggested learning experiences that meet the basic needs of youth and provide the mathematics necessary for a general education, and to present a suggested means for evaluating these experiences.

The "learning experiences" suggested were organized in an attempt to meet the mathematical needs as defined by the "Check List" of the Commission on Post-War Plans. In addition to an outline of each unit, evaluation techniques are suggested. The course was not conducted on an experimental basis.

Tests to measure critical thinking—The theses of Frank Hackman (4) and Lloyd Grever (3) represent attempts to measure "Critical Judgment" and "Critical Thinking" respectively. Mr. Hackman tests for four types of thinking in nongeometric situations. Part one, "Meaning of Terms," tests ability to recognize " the shifting of a definition during the course of an argument." Part two, "Conflicting Assumptions," tests the ability to "distinguish between relevant and irrelevant assumptions, to select underlying assumptions, to avoid a restatement of the conclusion as supporting evidence, and to recognize ridicule of a person as an evasion of the argument." Part three, "Appraising the Evidence," tests the ability to discern "relevant" and "irrelevant" evidence, to pick out evidence that leads to acceptance or rejection of the conclusion, to weigh the evidence as to its importance in the acceptance or rejection of the conclusion, and to avoid forming generalizations "based on inadequate sampling." Part four, "Judging Conclusions," tests ability to recognize necessary conclusions in "if-then" types of arguments. No statistical data on validity or reliability are given.

Mr. Grever tests for ten "behaviors" by presenting "problem situations." In the test, which was administered to 106 high-school geometry students, the split-half method yielded a reliability of 0.89. The test is reported to be "suitable for use at the high-school level."

Solid geometry—The decline in popularity of solid geometry in the secondary schools has disturbed many mathematicians in recent years. Several plans to remedy this situation are reported in the thesis of William Popejoy (7). A plan to teach a one-year course in plane and solid geometry is discussed, and research on the topic is reported. The history of the teaching of solid geometry is traced up to the time of its introduction into the modern high school.

Approximate computation—The fact that present textbooks do an inadequate job in presenting approximate computation has been pointed out by William Boyle(1). To acquaint teachers with the topic, he constructed a unit on approximate computation for the use of mathematics and science teachers. A unit for junior-high-school use is included along with suggestions for teaching approximate computation in the senior high school. A survey of literature on the subject is included.

History of the mathematics curriculum—Arthur Flynn(2) has presented a comprehensive study of the teaching of mathematics which he divided into three parts: (a) the ancient period embracing the Greek, Roman, and Asiatic cultures; (b) the middle part embracing medieval Europe and the Mohammedan empires; and (c) the modern period embracing the United States and Europe. Elementary and advanced mathematics are discussed on all educational levels.

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STUDENT TEACHING IN SECONDARY-SCHOOL MATHEMATICS

T. E. Rine*

Illinois State Normal University is a teacher-education institution whose primary purpose is the education of teachers. Its laboratory schools are maintained to give prospective teachers an opportunity to have actual teaching experience under competent supervison. This institution also has access to the facilities of various public schools for the purpose of giving student teachers an opportunity to teach in schools similar to those in which they will teach after graduation.

The Department of Mathematics at Illinois State Normal University is composed of teachers who have all had experience in teaching in the public schools. All have at least the master's degree; approximately half of the members of the Department of Mathematics have the doctor's degree. All are members of the National Education Association, the Illinois Education Association, the National Council of Teachers of Mathematics, the Illinois Council of Teachers of Mathe-

* Associate Professor of Mathematics

matics, and the Mathematical Association of America. All of the members of the Department of Mathematics participate directly in the student-teaching program.

A study of course offerings reveals much of interest regarding the mathematics courses prerequisite to student teaching in secondary-school mathematics. If the student has not completed a third semester of algebra and a course in solid geometry before entering the University, he must complete these requirements before he may do any further work in mathematics. Then, before he may begin his work in student teaching, the student must complete courses in plane and advanced trigonometry, analytic geometry, college algebra, differential and integral calculus, as well as all of his requirements in professional education. Work in college geometry and history of mathematics must either precede his student teaching or be taken concurrently with student teaching.

In regard to professional courses in mathematics, Illinois State Normal University offers the following: Foundations in Arithmetic, primarily for elementary teachers; Special Problems in Junior-High-School Mathematics; Field Work in Mathematics, a course in the outdoor use of instruments; and Survey of Mathematics. The course called Survey of Mathematics includes many of the concepts frequently included in professional courses in the teaching of mathematics in other teacher-education institutions as well as an analysis of secondary mathematics from an advanced viewpoint. Although a course in the teaching of mathematics is not offered, yet, in connection with the work in student teaching, many of the concepts are not actually omitted. They are considered in the bi-weekly seminars, in which all student teachers and faculty in the Department of Mathematics participate. These seminars are excellent in that the group considers the problems of the classroom as experienced immediately by the student teachers.

Besides the regularly scheduled seminars, where all of the supervisors and student teachers in secondary mathematics meet to discuss the common problems of the classroom, the supervisors meet in individual conferences with student teachers to discuss the particular problems associated with planning the daily lesson, testing, organizing units of instruction, and collecting and selecting materials of instruction, and assist with the detailed application of methods to the particular subject matter of mathematics.

Student teachers have access to files of information concerning the pupils whom they are teaching and are urged to make full use of available records. The student teacher is expected to obtain information from these records regarding the academic success and adjustment of his pupils. These files include such things as I.Q., mathematics-aptitude, and reading scores, as well as achievement grades in mathematics. Concerning the pupils' adjustment, they list such characteristics as co-operation, initiative, leadership, and work habits.

These records are discussed at the seminar meetings of all student teachers and of all supervisors of student teaching in secondary mathematics. Such questions as the following are discussed: How should the data be used? What data should be kept confidential? How are the data collected? To whom should the data be made available?

At Illinois State Normal University, the supervisors do much to encourage the professional growth of student teachers by recommending attendance at mathematics and other educational conferences, membership in professional organizations, and the reading of professional literature, as well as by discussing problems relating to professional ethics.

In the Department of Mathematics the student teachers do some practice teaching in practically all of the subject areas of secondary-school mathematics. At present there is a tendency to place all student teachers first in one of the traditional courses, usually algebra or geometry. After about twelve weeks of student teaching in this initial area, the student teacher is shifted to do his observing and teaching in some other area of secondary mathematics. In this way the student teacher is given the opportunity to become familiar with the teaching-learning situations in most of the teaching areas of secondary-school mathematics.

During the early stages of student teaching, the student teacher is "learning about" his pupils and observing the teaching of the supervisor. Gradually the student teacher takes on more and more responsibilities. First he gives pupils individualized instruction, then several pupils work with him at a time, and finally he takes over all the responsibilities of the classroom. While teaching, he is confronted with numerous problems; these problems are discussed either with his supervising teacher alone or in the bi-weekly seminars which are a required part of his student teaching and for which credit in student teaching is given.

After a period of about twelve weeks, the student teacher is shifted to a different group of learners under a different supervising teacher. He is informed of this shift two weeks in advance. Previously he has had observations in the classroom to which he is going so that he already knows most of the pupils there and they know him. The student teacher knows the supervisor in this classroom also, since he has already discussed numerous teaching problems with him and all of the other supervisors during the bi-weekly seminars. He now does only a few more days of observing in this classroom situation and very soon again takes over the full responsibilities of teaching, the decision being left to the supervisor as to how soon he should take over full responsibility. The supervisor in this classroom, who has discussed the work of the student teacher with his previous supervisor, attempts to give the student teacher experience in those areas where his need is the greatest. The individual conferences and bi-weekly seminars continue throughout the entire semester. If the student teacher's program permits and the supervisor feels that the student teacher is ready, or if

there is a particular need for him to teach in still another area, he is given the opportunity.

The student teacher has opportunities to participate in many activities outside of the practice-teaching classroom, including the high-school mathematics club, the assembly programs, the noon-hour activities, and the supervision of study halls. He also assists with plays, helps in sponsoring parties, and has a part in various other activities. He is encouraged to participate in many of these activities.

Illinois State Normal University sponsors a mathematics conference for both elementary and secondary teachers. Student teachers are given some duties in connection with this conference, and all student teachers in mathematics are expected to attend general and group meetings. Membership in the National Council of Teachers of Mathematics and other professional organizations is encouraged.

The Department of Mathematics gives a few students the opportunity to do off-campus student teaching. In this program the student teacher lives in the public-school community where he does his student teaching for a period of nine weeks. There he is given the opportunity to participate in most of the activities of a teacher of secondary mathematics in the kind of position which he is likely to have after graduation. The student electing to do this type of teaching has his program of classes arranged so that he can do full-time teaching, with no other college class responsibilities, for a period of nine weeks. The program has the disadvantage of not permitting close supervision. Nor does the student teacher have the opportunity to take part in the individual conferences and seminars in which those who are on the campus participate. However, it has the advantage of giving many experiences in the out-of-class activities of the community as well as those experiences that are associated with the problems of full-time teaching.

The supervisors and student teachers feel that both the on-campus and off-campus types of student teaching offer much for the students and would like to have each student be given the opportunity to participate in both programs. It is hoped that more time and credit for student teaching will be available to student teachers in the future. Many of the supervisors and students also feel that increased opportunity for laboratory experiences in the junior year should be made available.

After the student receives a position, he is invited to the campus to discuss with the mathematics supervisors and student teachers the immediate problems that face the teacher in his first year of teaching. This informal meeting, a coffee hour, is held during Homecoming, at which time many graduates return to the campus. The purposes of this meeting are to aid the new teacher in solving the problems that he is facing in his new teaching position, to orient the present student teachers to the problems faced by the first-year teacher of secondary mathematics, and to aid the Department of Mathematics in the improvement of its own professional program.

As part of the program for the evaluation of the student teacher himself, many of the competencies, including subject-matter proficiency, understandings, skills, abilities, attitudes, appreciations, and personal and professional qualifications, are discussed cooperatively with the student teacher in the early stages of his student-teaching period. He is made aware of goals toward which he will need to strive during his participation period of student teaching. Objectives of teaching secondary mathematics are discussed in individual conferences and in the bi-weekly seminars. The growth of the pupils under the student teacher's guidance toward the mutually agreed-upon objectives is considered as part of the evaluation of the student teacher. In frequent individual conferences, the student teacher discusses with the supervisor his own growth in teaching. His growth in classroom situations and in participation in the seminar meetings, his work with his own pupils outside of the classroom, his willingness and ability to assume responsibilities of teaching both in and out of the classroom are also considered in his evaluation. This continuous evaluation during the student-teaching period is intended to aid the student teacher in his growth as a professional teacher.

The faculty of the Department of Mathematics, working in close cooperation, discuss with one another the needs, strengths, and weaknesses of the various student teachers.

The student teachers themselves, meeting in closed session, are given an opportunity to evaluate their total experiences in student teaching in secondary mathematics. At this time they discuss with one another what they believe to be the strengths and weaknesses of their total student-teaching experience. This discussion is held after the student teacher's grade has already been determined so that he is under no pressure of having his comments influence his own final evaluation. A student chairman and secretary are elected by the group for this discussion, and a written report of this meeting is turned in to the faculty member who is in charge of the student-teaching seminars in mathematics. This report is utilized in helping the supervising teachers determine the nature of the student-teaching experiences for the following year.

The mathematics faculty also meets in closed session to discuss the final total evaluation of each student teacher. Each supervising teacher is given the opportunity to discuss the progress of the student teachers who have been under his guidance. The strengths and weaknesses of each student teacher are discussed to aid in the formulation of a written report of each student teacher's final evaluation and also to help the student teacher in his future growth. The supervisor to whom the student teacher was assigned originally is responsible for writing up his final evaluation. This total evaluation, even though written up by a single laboratory teacher, is the responsibility of the academic and laboratory teachers as a group.

This emerging practice in student teaching in secondary-school mathematics is not, perhaps, the most idealistic one that theorists might

describe. It is, however, a practice that does actually exist. It is a practice that is changing from year to year with the changing needs of the student teachers. The rather unique feature of the seminars is based on the principle that the supervisors must be able to do those things that are expected of the student teachers. The strength of the student-teaching program in secondary mathematics at Illinois State Normal University is based on the cooperative efforts of all of those who participate in the program.

MATHEMATICS GUIDANCE AT UNIVERSITY HIGH SCHOOL

DOUGLAS R. BEY*

Mathematics teachers quite often ask, "What kinds of courses do you have in your school and what types of students are in the classes?" By answering such questions about particular schools, one may help others and stimulate new ideas. Any mathematics program must, of course, be in the process of change. Some factors that influence this change are: the types of students and their needs, the emphasis in modern pure mathematics and in the applied fields, the studies in the curriculum, and the needs of society. No two schools necessarily want to do exactly the same thing with respect to these factors; however, many schools find uniformity in their thinking about some of these factors in their attempt to find a solution that is best for their situation. For that reason a rather detailed picture of the growth and development of the program at University High School may have interest for others.

There is no mathematics requirement at University High School; there has been none for more than ten years. Many of the high-school faculty members from various subject-matter fields other than mathematics have discussed this situation and feel that perhaps the school should require some mathematics. Since a satisfactory guidance program is followed at University High School, the mathematics staff prefers that mathematics be an elective subject. The guidance program makes students aware of the advantages of studying some mathematics and tries to help them make choices that will best fit their possible needs. In the past only a very small percentage of the students finished high school without taking some mathematics. Since mathematics is not required, the students are in an elective class; they are there because they chose to be there. The fact that the subject is elective has an important bearing on the atmosphere in the high-school mathematics class. If a student has developed an antagonism toward mathematics in grade school, this antagonism may increase if he is forced to take more mathematics in high school. A few such students in the class may create

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a tone which is not conducive to the finest learning situation. Furthermore, the same people who do not elect mathematics in their freshman year usually realize that they can profit by studying some mathematics and elect to take one course or more in their sophomore or junior year.

In the freshman year, a student may take either general mathematics or algebra. Taken into consideration are the scores on three tests given to all entering freshmen: the intelligence score, the reading score, and the algebra-aptitude score. Grades in arithmetic and also achievement scores are studied with the student. In addition, the deans of boys and girls, who do the programming, try to have a conference with the student's teachers and parents. As a tentative yardstick, the mathematics staff has set up a criterion for the selection of one of the following alternatives: if a person is below the fifteenth percentile on the algebra-aptitude test, he should select general mathematics; if he is above the fortieth percentile, he should select algebra. If his algebra-aptitude score falls between the fifteenth and fortieth percentile, the course which he selects should depend upon the results of the other two scores and upon his interest. Sometimes information from his teachers as to his work habits is a deciding factor. This criterion results only in a suggestion from the deans; the students and parents, of course, have the last word. The students are happy to know that there is such a criterion, and they use it to make their choice. This criterion makes possible for the Department of Mathematics the maintenance of a very high level of work in the algebra classes. In other words the work in algebra is stimulating for the better students and gives them an adequate background for future specialized work in college.

The distribution of entering freshmen on intelligence scores or, in fact, on reading or algebra-aptitude scores has been a bi-modal one. There are a large number of students at the top and a fairly large number at the bottom. Some students are at the second- or third-grade reading level. A small class in an introductory course in mathematics was instituted so that these people might receive more individual help than they could be given in a regular course. This class was kept at ten or less, but, because of a shortage of staff members, it had to be discontinued.

There are 130 students in the 1953-54 freshman class at University High School; most of these people take mathematics. The schedule consists of two classes of general mathematics and three of algebra, with an average of about twenty-five students in each class. It was hoped that the number of people in the general-mathematics classes could be kept at fifteen or less. However, this entering class has forty-three students who ranked below the fifteenth percentile on the algebra-aptitude test as compared with thirty-six above the fortieth percentile. On the reading test the class has thirty-eight at the sixth-grade level or less and the same number at the tenth-grade level or above. If that distribution continues, the mathematics staff may wish to add a class in general mathematics and perhaps discontinue a class in algebra.

Continued work in mathematics after the freshman year is encouraged by the mathematics staff when they feel that it is for the best interest of the student. In other words a large amount of guidance in mathematics is assumed by the teacher of any mathematics class. The present offerings in mathematics beyond algebra are a class in plane geometry, a semester of advanced algebra, and a semester of solid geometry. Fifty students are taking algebra in three classes, and twenty-nine are taking advanced algebra in one class.

In a recent year at University High School, from a graduating class of seventy-two students, fifty-seven went on to college. That ratio was rather typical for a period of time. Entering classes have ranged in size from eighty to ninety people for a number of years. Last year, however, twenty-nine students from a class of seventy-three went on to college. This ratio may not be typical; on the other hand it may indicate a changing school population.

The high level of work required in algebra is also required in plane geometry and in other advanced courses. These courses are academic in the sense that the students are challenged to build adequate background for future study. The Department has felt the importance of defining its goals and of making them known to counselors and teachers doing guidance work so that they can do a satisfactory job in helping students to make their selections of courses.

One unsolved problem in this whole guidance plan relates to the student who is a border-line case; the problem is whether that student should select algebra or general mathematics. At present such students are scheduled for algebra at the same hour that a general mathematics class is available and are permitted to transfer to general mathematics at the end of the first six weeks if the transfer seems desirable. However, it is frequently difficult for the counselor or teacher to determine whether the student cannot handle algebra or whether he wishes to change to general mathematics merely because less work is required. The decision is finally made by the student and the algebra teacher. The student may stay in the algebra class, may change to general mathematics, or may drop out of mathematics entirely. The fact that some people do choose general mathematics after a try at algebra does show that there is some flexibility to the guidance program. That flexibility certainly results in a decrease in the number of failures. During the first semester of the 1953-54 school year two or three people made this change.

As a result of guidance studies other developments in educational programs frequently begin. For example, consideration has been given by the mathematics staff to the development of other courses. A fourth-year course in mathematics was suggested which would include college algebra, trigonometry, and analytic geometry. It is believed that such a course should be offered only to the most outstanding students and should provide the opportunity not only to review the former work but also to broaden mathematical concepts. There is also hope that some work in basic mathematics might be given in the senior year. Such

course work would be designed for students who have not had any courses in high-school mathematics or for students who took general mathematics.

Another area in which guidance in mathematics may be found is the mathematics club. This club was formed by a group of University High School students under the sponsorship of Miss Edna Norskog in 1948 so that they could have the opportunity of discovering some of the aspects of mathematics that are not usually a part of the regular class work. The high degree of interest which has developed within this group has carried over into the classroom.

The program of guidance in mathematics at the University High School has proved that combined effort is necessary if the needs of the students are to be met. One cannot answer the question "How well are we meeting the needs of the students?" unless continuous thought and effort are applied. Such co-operative thought and effort will result, it is believed, not only in professional growth but also in mathematics courses that are vital and that maintain the respect and confidence of students.

THE JUNIOR-HIGH-SCHOOL PROGRAM

FRANCIS R. BROWN*

The program at Illinois State Normal University to train teachers for teaching mathematics in the junior high school has had a long and varied history. The need for a type of training that is different from that for the teacher of either the elementary school or the high school has been recognized and encouraged. The Department of Mathematics has recently taken another step in developing a program to help educate prospective junior-high-school teachers to give to adolescents the best mathematical education that is possible within the framework of the present knowledge of psychology and related fields.

The need for alertness to changes in the training program is summarized by Dr. Charles Butler who said recently: "Probably the most significant change in the whole program of secondary-school mathematics has come in the junior high school where general mathematics has practically replaced straight arithmetic in grades seven and eight and has become the typical alternative to algebra in grade nine. This change has come about in a gradual, orderly, and unspectacular manner over a period of years."[1]

Before considering the various teacher-training programs at Illinois State Normal University, it will be helpful to get an idea of today's typical mathematics curriculum in the junior high school.

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[1] C. H. Butler, "Meaningful Mathematics," *National Education Association Journal*, XL (March, 1951), 206.

The functions in mathematics in the junior high school are based on the need for meeting the present individual differences of the pupil population, giving exploratory and guidance opportunities, and fulfilling the obligation of a transition period between arithmetic and the formal courses of algebra and geometry.

Teachers and other curriculum workers have received help from the leaders in mathematics who prepared the influential reports of 1923 and 1940. Even at the early stage of development of the junior high school, the writers of the 1923 report gave guidance through a listing of appropriate topics and suggested experimentation to develop a curriculum "to give the pupil as broad an outlook over the various fields of mathematics as is consistent with sound scholarship. These years especially are the ones in which the pupil should have the opportunity to find himself, to test his abilities and aptitudes, and to secure information and experience that might help him to choose wisely his later courses and ultimately his life work."[2] The 1940 Report[3] is more specific in the suggestions given. But lest the reader become too content that the syllabus is now fully developed, he needs to listen to Dr. Howard Fehr,[4] a national leader in the field of mathematics education, who has said that there is more need for careful research in the area of junior-high-school mathematics than in any other area of the field. Too much of the content and too many of the methods are based on opinion. A review of the various textbooks available today soon reveals that the course is far from standardized. This lack of standardization may be a healthy sign of the experimental and pioneering attitude of textbook writers, but it should not result in the denial of the necessity to determine whether the objectives are being met.

It is true that the present course is an attempt to integrate materials from arithmetic, algebra, geometry, statistics, and trigonometry. Influenced by European practice, the contents of the different branches are paralleled, and the materials from any of them that are useful for a particular problem are utilized. The content is not a sampling from each area; it is rather a well-developed and well-organized arrangement that offers the pupil the opportunity to learn significant developments.

A basic assumption of the program is that mathematics is a way of thinking with quantitative data. Arithmetic offers rich experiences in the development of meaning in the mathematical phase, such as the processes with integers and fractions and per cents. Furthermore, it offers considerable work on the economic phases of living: consumer

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[2] National Committee on Mathematical Requirements, *The Reorganization of Mathematics in Secondary Education* (Boston: Houghton Mifflin Company, 1927), p. 20.

[3] National Council of Teachers of Mathematics, *Fifteenth Yearbook: The Place of Mathematics in Secondary Education* (New York: Bureau of Publications, Teachers College, Columbia University, 1940), pp.78-91 and 246-53.

[4] One of the principal speakers at the Illinois State Normal University Fifth Annual Spring Mathematics Conference, April 23, 1952.

credit, insurance, banking, and taxes. These materials vary greatly with the community, the choice of textbook, and the training of the teacher.

The algebra phase of the present course is developed as a convenient and powerful aid in problem solving. The use of symbolism aids in thinking. The technical aspects are reserved for the formal algebra course.

Another controversial topic is informational geometry. It is generally agreed that the mensuration materials offer useful information and give incentive for working with fundamentals. The inductive approach in developing vocabulary and simple geometric concepts can be of considerable aid for the pupil taking the formal geometry course later. One of the controversial points concerns the amount of this type of material that can and should be taught at the junior-high-school level.

The foregoing discussion illustrates well enough that a teacher needs a broad training in subject matter as well as in methods of presenting the subject matter to this age group.

The Department of Mathematics at Illinois State Normal University has developed a program for the teachers of the upper grades. This program consists of three courses. The first course, taken by college freshmen, is basically intended to give the student the opportunity to study not only arithmetic fundamentals and uses but also informational geometric materials from a mature point of view. It is the purpose of this course to foster the development of desirable attitudes toward the importance of mathematics in the lives of all persons.

All prospective teachers for elementary schools take a course in the foundations of arithmetic. This course continues the mature study of arithmetic; the emphasis now, however, is placed on materials and methods of teaching arithmetic.

The teachers preparing for teaching upper grades and junior high school continue their preparation in mathematics by a study of special problems in arithmetic. It is during this study that the various topics dealing with the social uses of arithmetic are investigated. Discussions are devoted to special problems in which the students make use of local information in their work. The use of activities, such as visual aids, field trips, bulletin boards, notebooks, and projects, is investigated in the light of recent findings in psychology. A considerable portion of the study is devoted to the consideration of the purpose and materials of informational geometry. The meaning and techniques of problem-solving are stressed throughout.

Because the records showed that several of the mathematics majors did teaching in junior high schools, a special course on the methods and materials of teaching in the junior high school was made a requirement for mathematics majors. This course was successful but was dropped because of a college-wide experiment which emphasized the giving of methods suggestions in terms of specific teaching problems.

The plan to give methods suggestions in terms of specific teaching problems did not, however, give all students the opportunity to learn about the materials used in the junior high school. Furthermore, the trend toward an increased emphasis on general mathematics was rapidly developing. In addition, the program to develop teachers of traditional high-school mathematics courses did not give help on some of the materials and methods needed for the second-track courses. In 1949, therefore, a policy was adopted to allow prospective high-school teachers to take the course in selected topics in arithmetic. The students, who had two different backgrounds of training, found that it was to their mutual advantage to work together in this course. This plan has worked satisfactorily, but two weaknesses in particular have been noted. In the first place, those students who have had the elementary-school training often have an inadequate background in mathematical concepts to develop the capabilities of the pupils at the junior-high-school level and to give adequate guidance. On the other hand, the persons who have had the high-school training background often fail to understand the nature of the fundamental concepts and processes and the methods of teaching them.

The next step in planning the preparation of junior-high-school mathematics teachers who will have competence in mathematical subject matter and in methods of thinking and who will have an understanding of the appropriate social topics has been to include three new courses in the new curriculum for junior-high-school teachers. The first two courses are designed to give the student the necessary mathematical background by offering him an integrated course that draws from the areas of college algebra, trigonometry, statistics, and analytic geometry. The third course includes materials and methods from the junior-high-school course and also from the foundations course for teaching the fundamental concepts and processes of arithmetic. The climax of the program is student teaching in the junior high school.

It has been said that "In the junior high school the program of mathematics is more nearly fitted to the needs of the pupil than it is at any other level."[5] Although this statement may be true, the members of the Illinois State Normal University Department of Mathematics feel the definite challenge to prepare teachers who are leaders in meeting the needs of adolescents. This new program is the most recent attempt to meet such a challenge.

[5] L. B. Kinney and C. R. Purdy, *Teaching Mathematics in the Secondary Schools* (New York: Rinehart & Company, Inc., 1952), p. 224.

ARITHMETIC AND THE MATURE MIND

ELINOR B. FLAGG*

At least one of the four freedoms, freedom from fear, merits special consideration by the teacher of arithmetic. When freedom of speech, freedom to worship, freedom from want, and freedom from fear were first proposed, the author of these ideals probably had no thought of applying "freedom from fear" to a particular group of people, that is, to teachers of arithmetic. However, the suggestion that freedom from fear is basic to the happiness, well-being, and perpetuation of civilization, together with Dr. H. A. Overstreet's book entitled *The Mature Mind*,[1] has brought attention to the desirability of having arithmetic teachers free from fear of their subject.

Too many people are afraid of arithmetic; too many prospective teachers are afraid of arithmetic; too many people "freeze up" at the slightest suggestion of anything arithmetical. It is impossible to define exactly what is meant by "too many," but an illustration may serve to clarify. Of ninety-one students, all high-school graduates, enrolled in an arithmetic class for freshmen at Illinois State Normal University in a recent year, forty-four said, at the beginning of the course, that they were afraid, or somewhat afraid, of arithmetic. Are not forty-four "too many"? No doubt this fear is not peculiar to students in one school.

The students in this "afraid" group knew some arithmetic; they knew how to perform the four fundamental operations reasonably well, but they were not sure when to use these operations; they knew how to read well enough to secure a high-school diploma, yet they were unaware that there was any real meaning to a "word problem." They said that they did not know why the things they did, the motions through which they moved, solved a problem. They did not realize that a formula could be developed, or that it had meaning; to them, it was only a statement to be memorized which, somehow, produced the answer. Lastly, they did not realize that arithmetic has an orderly developmental arrangement.

A disturbing thought in this situation is that the teacher who fears arithmetic, and is therefore insecure in teaching it, may transfer to his students his own lack of confidence toward a subject vital to intelligent, every-day living. This lack of confidence implies a lack of maturity on the part of the person who experiences the fear; it means, in the case of arithmetic, that the person is not yet mature with respect to arithmetic. Mental immaturity in an adult implies, according to Dr. Overstreet, that the adult is trying to work out his problems by childish means.

Dr. Overstreet, in his book, says that something can be done about immaturities since they are subject to change, that they can at least be

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[1] H. A. Overstreet, *The Mature Mind* (New York: W. W. Norton and Company, Inc., 1949).

recognized for what they are and their influence lessened. The conditions that caused them and that encourage their continuance can be altered. A person is properly maturing, Dr. Overstreet states, if his "power over his environment is matched by a growing awareness of what is involved in what he does." If his "powers of execution forge ahead while his powers of understanding lag behind," Dr. Overstreet adds, "he is backward in his psychological growth."

It would seem desirable that the elementary teacher have "power" over his arithmetic environment, a power matched by a growing awareness of what is involved in what he does. It would seem desirable that he increase his confidence through the experience of solving problems correctly, with full understanding of the number system he uses and of the operations involved.

The purpose of this article is to make suggestions which may be of assistance to the arithmetic teacher in increasing his arithmetic maturity, that is, to make suggestions which will help him to develop an increased "awareness of what is involved in what he does." It is suggested (1) that the teacher have some knowledge of the historical development of the number system, (2) that he recognize the arbitrary and logical features of the system and distinguish between them, and (3) that he recognize the logical developmental structure of the arithmetic of the elementary school.

First of all, the teacher should have an appreciation of the historical development of the number system; the fact that it grew slowly carries major implications, especially for the teacher of beginners. The fact that number in its early stages was associated with concrete objects and that later mankind learned to dissociate a number name from any one particular kind of object would seem to imply that children move gradually from the concrete to the abstract meaning of number. It suggests that children should be given ample experience in associating concrete objects with a particular number word before the word is used in a general or an abstract way.

The present number system is a human invention, governed by laws which have come to be accepted by civilization. But there have been other symbols in use, and there are other laws for combining symbols. The present system uses the base *10*, although other bases have been used. The arithmetic stature of the elementary teacher will be increased through his understanding of bases other than *10*, and through his attempting to invent a system with symbols other than those which are commonly accepted. He will profit by knowing something of the old-time counting board and the abacus with their applications of place value; he will learn from these devices that the terms "carry" and "borrow" once had a literal interpretation.

Secondly, it is suggested that the teacher recognize the arbitrary and the logical features of the number system. It is generally conceded that arithmetic is a "reasoning" subject. The well-informed teacher recognizes not only that many aspects of arithmetic are based upon reasoning but also that there are some aspects of arithmetic about

which no reasoning can be done. There are certain memorized learnings that must be accepted before any reasoning can be done, just as there are certain definitions and postulates upon which agreement must be reached before reasoning can be done on any subject. The very composition of the number system is such that, before reasoning can be accomplished, certain arbitrary learnings must be accepted as well as certain laws for the operation of the system. For example, not much reasoning is possible until the fact that a certain group of objects and a certain number symbol represent the same idea is memorized; not much reasoning can be done until the laws for combining number symbols are accepted.

There are arbitrary features also in the later phases of arithmetic. Such terms as *area* and *divide* are put to uses upon which conventional agreement has been reached. There is a memorization aspect in learning what the word *area* means, but its use can be made truly vital by actually covering a surface with square units before the word *area* is put into the vocabulary. *Divide* has two uses, two translations: in one problem, it may be used to indicate partition; in another it may indicate measurement. When only abstract numbers appear in an exercise, either translation is possible. The tendency to memorize a formula without developing it or giving it meaning is probably a carry-over from other memorizations too frequently required. The meaning and use of a formula, like the definition for *area,* should grow from experiences which lead to the general idea expressed in the concise language of the formula.

The very fact that the first learnings in arithmetic are arbitrary and unreasoned, and yet must be accepted before children proceed beyond counting and beyond writing numbers, gives arithmetic a nonrational beginning. The very fact that the early phases of arithmetic are *musts* leads many otherwise intelligent people to seek unreasoned patterns in later levels of the subject. Too frequently this appeal is heard, "If you would only give us a pattern or a model to follow, we could get the problems on this page."

Thinking or reasoning in arithmetic has no opportunity to begin until the conventional associations and the conventional laws have been accepted. Once the Hindu-Arabic system and the laws through which it operates have been accepted, then, and only then, can a logical system be built.

Thirdly, it is suggested that the teacher have an appreciation of the logical structure of elementary-school arithmetic; it is suggested that he be aware of the dependency of certain operations on previously learned meanings or operations.

To illustrate this point, the following list of sequences is cited: Out of the meaning that has been given arbitrarily to number symbols, the idea of counting develops logically. From the acceptance of rational counting, the idea of addition can be made meaningful, for addition is but a short way for doing counting. And once counting and addition are understood, subtraction, multiplication, and division can be de-

veloped in such a way that the words have meaning. Unit fractions can be given meaning by associating them with division; the meanings of other fractions can grow from the meaning of a unit fraction. A decimal is merely a special common fraction written in a new way. The decimal can also be made meaningful through extending the idea of place value to the right of the decimal point. A per cent is but a special decimal, written, again, in a new way.

This entire list of sequences stems from and is dependent on the understanding of rational counting. The appreciation of these dependencies leads to a third mark of maturity, an awareness of the dependent, logical order of topics. The teacher who has attained this phase of maturity recognizes the need of certain pupil maturities before a new topic is presented.

No doubt there are other desirable maturities, and no doubt there are smaller compartments into which these maturities can be separated. The maturities suggested are those which seem to the writer to be most contributive to the dispelling of fear and thus to the building of security in arithmetic.

The Department of Mathematics at Illinois State Normal University offers three courses for prospective elementary teachers which aim toward accomplishing the maturities mentioned above. A course entitled Arithmetic in Modern Life is offered in the freshman year; a second course entitled Foundations in Arithmetic is offered on the senior college level; a third course, Selected Topics in Arithmetic, is offered for students who plan to teach in the upper grades. Many students in the Special-Education field also take the first two courses. The second and third courses are frequently elected by mathematics majors and minors. Through extension classes taught off campus, and through occasions when arithmetic consultants are requested, the members of the Department of Mathematics seek to keep these maturities as a goal for elementary teachers in the field.

The aim of arithmetic, on the elementary level, is to help children to behave maturely when they are confronted with quantitative situations; the aim of arithmetic work on the teachers-college level is to help prospective teachers to behave maturely when confronted with quantitative situations and to prepare them to develop in their pupils these same maturities. As a child, the prospective teacher must have seen the number system from a child's level of maturity; as an adult, particularly an adult who anticipates introducing this system to others, he needs to view arithmetic from an adult level of maturity, seeing it as a growing sequential system, and seeing it with a fearless attitude.

CONFERENCES ON THE TEACHING OF MATHEMATICS

BJARNE R. ULLSVIK

In 1948 the Department of Mathematics realized an ambition of long standing by sponsoring a conference on the teaching of elementary-school mathematics and secondary-school mathematics. About two hundred fifty teachers of mathematics attended this first conference and were inspired by presentations from fellow teachers and by the two main speakers, Mary Potter, Supervisor of Mathematics, Racine, Wisconsin, and M. L. Hartung, University of Chicago. The seventh mathematics conference will be held on April 3, 1954, at which time Robert C. Yates, U. S. Military Academy, and M. L. Hartung will serve as main speakers.

These conferences have grown in favor with teachers of mathematics in the area served by Illinois State Normal University, and the attendance has been maintained at about three hundred. Each of the conferences has been of the same general form, having a headline speaker at sessions for both elementary- and secondary-school teachers. These larger section meetings are followed by discussion groups on topics pertinent to the problems met by classroom teachers. The planners of the conferences have been, indeed, fortunate in securing top national leaders in the teaching of both arithmetic and secondary-school mathematics. In addition to the speakers named above, others who have appeared as principal speakers are: Frank B. Allen, Leo J. Brueckner, John R. Clark, H. P. Fawcett, Howard Fehr, Ann Gustafson, E. H. C. Hildebrandt, Henry Van Engen, H. G. Wheat, F. L. Wren.

The Illinois State Normal University Department of Mathematics is anxious for the opportunity to serve teachers of mathematics through such conferences. The Department is appreciative of the cooperation which has made these conferences possible and which has resulted in suggestions from classroom teachers for the improvement of both the undergraduate and graduate programs sponsored by the Department.

EDNA M. NORSKOG—IN MEMORIAM

CLYDE T. MCCORMICK*

On May 14, 1953, we were saddened by the passing of our friend, Miss Edna M. Norskog, Assistant Professor of Mathematics at Illinois State Normal University. All of us in the Department of Mathematics and others who knew her felt the loss keenly and personally, for somehow she had touched us all with the glow and radiance of a truly dedicated spirit.

* Professor of Mathematics

Miss Norskog was born in Houston, Minnesota, on August 18, 1900. She obtained a bachelor's degree at St. Olaf College, Northfield, Minnesota, and did graduate work at a number of universities, securing a master's degree from Columbia University.

A member of the mathematics staff since 1948, Miss Norskog had taught in the high schools at Warren, Spring Grove, Houston, Northfield, and Alexandria, Minnesota, before coming to Normal.

She was formerly president of the mathematics section of the Minnesota Education Association and the Minnesota representative of the National Council of Teachers of Mathematics.

To the Department Miss Norskog left mathematics books and magazines, a number of other practical teaching devices, and a case for filing these materials; this case is to be known as the Edna M. Norskog Mathematics Laboratory. These mementos will not be necessary to remind us of the fine association we had with her and of the contribution she made to the students.

Evidence of Miss Norskog's sincere concern for teaching, for her pupils, and for the high goal of all teaching was well illustrated when she stated to a member of the Department of Mathematics that the teacher's daily prayer should be: "Lord, teach me how to pray, live, and teach!" Her deep religious convictions were connected with the way she dreamed, the way she thought, the way she worked, the way she died, and, most of all, the way she affected those with whom she came in contact. Through her chosen medium—the teaching of mathematics—she truly used her life to make this world a better place in which to live.

Patience, kindness, good will, humility, honesty, courtesy, unselfishness, sincerity—these qualities of Miss Norskog made her a choice person whom we had the privilege of having with us in the Department of Mathematics for too short a time. She has passed away; yet she is still with us. She lives in the hearts of all who knew her and caught the spirit of her inspiring life. Through her fellow teachers and pupils she still lives and will live for generations to come.

There is no death! The stars go down
To rise upon some fairer shore,
And bright in Heaven's jeweled crown,
They shine forever more.

—*John L. McCreery*

PROFESSIONAL ACTIVITIES OF THE FACULTY

Mary S. Arnold, assistant professor and supervising teacher in the third grade, was a delegate from the Central Division to the Centennial Meeting of the Illinois Education Association in Chicago, December 28-30. She served as discussion leader on "Discipline" at the Grundy County Institute in Morris, February 5.

Dr. G. Bradford Barber, assistant professor of speech, wrote articles on "The Analysis and Evaluation of Forensic Contests" appearing in the January issues of *The Speech Teacher* and the *North Central Association Quarterly.*

James M. Becker, assistant professor of the teaching of social science, was a discussion leader for an Illinois Curriculum Program—Citizenship Education Project conference in Clinton, December 5.

Dr. Chris A. DeYoung, professor of education and head of the department of education and psychology, spoke on "Netherlands," December 1, to the Woman's Club in Dwight. On December 28, he talked on "International Education" to the Rotary Club in Kalamazoo, Michigan, and on December 29, he spoke to Phi Delta Kappa in Chicago on "Commission on International Education." "Lessons Learned Overseas" was his topic for the Daughters of the American Revolution in Petersburg, January 6. Dr. DeYoung discussed "The Teacher's Sixth Sense—Humor" on January 11, for the Will County Institute in Joliet. "Citizenship" was the subject for the Douglas County Institute in Villa Grove on January 19. Dr. DeYoung talked on "Promising Practices in International Education" at the annual meeting of the American Association of Colleges for Teacher Education on February 12 in Chicago.

Preston M. Ensign, business manager, acted as coordinator for a panel discussion entitled "Are Our Public and Employee Relations Showing?" This program was a part of the Midwestern Regional Meeting of the College and University Personnel Association, at the Illinois Institute of Technology in Chicago, February 5.

Dr. Esther L. French, professor of health and physical education and head of the department of health and physical education for women, as a member of the editorial committee for the National Association for Physical Education of College Women, edited the biennial report of that organization. On February 22, she served with Dr. Clifford E. Horton as a consultant for the physical education department of Streator High School, Streator, in an evaluation of the program and facilities. Miss Ruth Bird, assistant professor of the teaching of health and physical education and a former teacher at Streator High School, accompanied Dr. French and Dr. Horton.

Malinda Dean Garton, assistant professor and supervising teacher of the mentally retarded, intermediate, wrote an article, "Health and Safety for the Mentally Retarded," which appears in the February issue of *The Instructor.*

Gerald F. Gates, assistant professor in the teaching of art, has an article on "Experimentation with Free and Inexpensive Materials" in the February issue of *Junior Arts and Activities.*

Dr. Miriam Gray, associate professor of health and physical education, and several senior students co-operated with the 4-H Clubs of McLean County by conducting a recreation training clinic in Bloomington for seventy-five leaders between the ages of ten and twenty-one.

Dr. Edna M. Gueffroy, associate professor of geography, was re-elected national treasurer, for a four-year term, of Gamma Theta Upsilon, professional fraternity in geography, at the Buffalo, New York, convocation on November 27.

Dr. Gertrude M. Hall, director of publicity, wrote two articles dealing with the centennial of the Illinois Education Association which appeared in the December issues of *Illinois Education* and *Education Today*. She attended the centennial meeting of the Illinois Education Association and the annual meeting of the Joint Alumni Council in Chicago during the Christmas holidays. As a member of the public-relations committee, she served on the program of the American Association of Colleges for Teacher Education, February 13, in Chicago.

Howard J. Hancock, director of athletics, spoke on December 1 at an athletic banquet in Earlville on the subject "Athletics in Our Schools." This was a community affair with a mixed group of 250 to 300 people present. On December 2, he spoke on "Changes in Athletics" at an athletic banquet in Carrollton. Mr. Hancock talked at the Illio Conference athletic banquet in Metamora, December 10. About 300 people from eight schools heard his topic, "Athletics, Past and Present."

Robert H. Holtzman, assistant professor of education, spoke to the Unitarian Fellowship Unit of Decatur on Sunday, January 17, on "The Present Status of the Philosophical Arguments in Support of Religion."

Dr. Clifford E. Horton, professor of health and physical education and director of the division of health and physical education, met with faculty representatives of the Interstate Intercollegiate Athletic Conference in Chicago on December 4 to conclude matters pertaining to the eligibility of athletes in the Conference. He was acting in his capacity as a commissioner of the Conference. On December 8, he was called to speak at the meeting in Gilman of the Elementary School Principals of Iroquois County on the problem of physical education and inter-scholastic athletics in the elementary schools. Dr. Horton attended, on January 8-9 in Chicago, the planning committee meeting of the Illinois Association for Health, Physical Education, and Recreation to advise on program arrangements for a state meeting in November, 1954. He was appointed chairman of a committee to draw up criteria to assist the state superintendent of instruction in securing a replacement for an assistant in the Illinois Department of Public Instruction. On January 21, he spoke at the Whittier School, Peoria, on the physical education and athletic program at the elementary-school level. He spoke at the Parent-Teacher-Association meeting, February 17, at Chatsworth concerning the Camp for Physically Handicapped Children conducted by Illinois State Normal University. With Dr. Esther French and Miss Ruth Bird he was called for consultation, February 22, concerning the program of health and physical education at Streator High School in Streator.

Dr. Anna L. Keaton, dean of women, participated with R. H. Moore and Ella Leppert, in a panel discussion on "A Mature Personality as Related to a Christian Teacher," at the Wesley Foundation of the First Methodist Church in Normal, Sunday, January 17.

Frank LeJeune, instructor in music, participated in a panel discussion at the state conference of the Music Teachers National Association held at Illinois Wesleyan University, January 11. He performed, playing cello, in a faculty concert of chamber music given in the Music Room of the Special Education Building of Illinois State Normal University, January 17. Two previous concerts had been given on October 25 and November 8.

Dr. Ella C. Leppert, associate professor of education, spoke on "Teaching the Social Problems Course in the Senior High School" in Oshkosh, Wisconsin, on November 21, at a meeting of the Social Studies teachers of the Northeastern-

Wisconsin Education Association. On December 5 she conducted a one-day workshop, at Clinton, in citizenship education for the Illinois Curriculum Program—Citizenship Education Project. The Young Citizens met in conjunction with the collaborating teachers; one hundred fifty teachers and students attended from the twenty school systems in Central Illinois. Dr. Leppert represented the Classroom Teachers at the Allerton House Conference on Education, Allerton Park, December 10. She served as the chairman of the publicity committee for the Illinois Association for Supervision and Curriculum Development *Newsletter* released December 15. The November issue of the *Councilor,* the official publication of the Illinois Council for the Social Studies, contains an article written by Miss Leppert and Mr. Edward Weir, ICP-CEP Consultant, University of Illinois. The article is entitled "The Illinois Curriculum Program—Citizenship Education Project." For the County Institute at Tuscola, January 19, Miss Leppert served as a resource person to secondary-school teachers on improving programs in citizenship education.

Dr. Harry D. Lovelass, principal of University High School, served as chairman of the state conference of Guidance Round-table Discussion Groups section leaders at Springfield, December 4. He is state chairman of the Committee for Guidance Round-table Discussion Groups, a committee of the Illinois Guidance and Personnel Association. He attended the annual meeting of the National Association of Secondary-School Principals at Milwaukee, Wisconsin, February 20-24.

Neva McDavitt, assistant professor of geography, was elected national secretary of Gamma Theta Upsilon, the professional fraternity in geography, at the Buffalo, New York, convocation on November 27.

Dorothy M. McEvoy, instructor and supervising teacher of the deaf and hard of hearing, appears in the December issue of the *National Geographic Magazine* in an article on "Illinois—Healthy Heart of the Nation." The only photo devoted to education is one taken in her room of the Special Education Building showing her working with a five-year old child, Larry Phillis, of Bloomington, while a student teacher, Eleanor Webb of Bushnell, observes.

Dr. Stanley S. Marzolf, professor of psychology, is a member of the Subdoctoral Training Committee of the Division of Counseling of the American Psychological Association. He is a member of the Council of Representatives of State Psychological Associations.

Dr. Ralph A. Micken, professor of speech, spoke on "Conviction and Probability in Debate" at the national convention of the Speech Association of America in New York, December 28. He was a member of a panel on "Tournament Improvement" at a session of the American Forensics Association, in New York, December 29. His article on "Teaching of Speech and Contemporary Affairs" appears in the *Bulletin of the National Association of Secondary School Principals* for January. Dr. Micken moderated a panel discussion on "Adult Education—New Fields" at the Adult Education Conference held in the Y.W.C.A. in Bloomington, January 12.

Dr. L. W. Miller, director of University field services, spoke on "Science in Elementary Schools" at a meeting of the elementary principals of Iroquois County in Gilman, December 8. His topic at the annual County Teachers' Institute in Pontiac, March 8, was "Vitalizing the Science Program."

Dr. Murray Lincoln Miller, director of audio-visual education, was a guest of the Radio and Television Manufacturers Association's Committee on Communications Equipment in Education at a meeting held with the United States Office of Education on December 8-10 in Washing-

ton, D.C. New publications of the joint committee were planned. He spoke about audio-visual education to a Parent-Teacher Association in Piper City on January 4, and to a businessmen's group in Rantoul on January 8 about the way to improve reading speed and comprehension. Dr. Miller attended a planning-committee meeting at the Morrison Hotel in Chicago on January 11 as chairman of the convention tape recording for the Department of Audio-Visual Instruction of the National Education Association, which met March 2-5. He also attended the Illinois Audio-Visual Association conference in Chicago to discuss publications of the Illinois Audio-Visual Handbook, the outcome of the Audio-Visual Education Survey of 1952-53 of which he was the chairman.

Dr. Clifford N. Mills, professor of mathematics, and head of the department of mathematics, spoke on "Trends in the Teaching of Arithmetic" at a meeting of the Pekin Elementary-Teachers Association in Pekin on January 7.

Leslie D. Park, instructor and supervising teacher in health and physical education, spoke to the Bent School Parent-Teacher Association, January 21, on the topic "Not As I Say—," a presentation concerned with parent-teacher co-operation and its relationship to the influencing of children.

Dr. Rose E. Parker, professor of education and director of the division of special education, spoke before the Ideal Women's Club in Chicago, January 7, on the subject, "Teacher Preparation for Exceptional Children."

Cecilia H. Peikert, director of museums, participated in the making of a movie, "Bulletin Boards for Effective Teaching," released by the State University of Iowa in December. She furnished the materials and wrote the script for the 400-foot color-sound movie, the purpose of which is to present ideas and techniques that will help a teacher make improved use of the bulletin board for teaching purposes. The movie is intended for use with teacher-training classes, in-service classes, teacher workshops, and faculty meetings.

Dr. Vernon L. Replogle, principal of Metcalf Elementary School, participated in the Teacher Recruitment Conference sponsored by the Illinois Chamber of Commerce in Springfield on December 10. On the same day he served as consultant to the Springfield public schools on an experiment in spelling in the elementary schools, and, on December 12, he was a consultant in a conference sponsored by the Illinois Curriculum Program on "Elementary Education." He was a consultant, January 11, for the McLean County School Board Conference, held at Illinois Wesleyan University in Bloomington. He attended the regional conference of the Association for Student Teaching, February 12-13, in Chicago.

Dr. T. E. Rine, associate professor of mathematics, was the author of an article, "Integration in the Teaching of Trigonometry in the Secondary School," published in the November issue of *School Science and Mathematics*. He wrote a chapter in the *Twenty-Second Yearbook* of the National Council of Teachers of Mathematics. The chapter is entitled "Student Teaching in Secondary Mathematics at Illinois State Normal University."

Doris Robie, assistant professor of health and physical education as well as physical therapist in special education, explained "Our Program for Exceptional Children" on January 9 at the bi-monthly meeting of the Illinois Chapter of the American Physical Therapy Association at the Special Education Building in Normal. The purpose of the meeting was not only to acquaint the physical therapists in central and southern Illinois with Illinois State Normal University and with its program for educating teachers for

exceptional children but also to give them a general idea of how the various special services coordinate to help the individual child. On January 14, a dinner meeting was held in Danville for the purpose of discussing "Teamwork in the Care and Management of Cerebral-Palsy Patients." Miss Robie and Dr. Dorathy Eckelmann, associate professor of speech, contributed to the discussion from the standpoint of physical therapy and speech correction, giving concrete suggestions to the parents of cerebral-palsy patients with respect to the ways in which they may help with the problems in their community. The need for understanding, for co-operation, and for trained personnel, including trained teachers to handle the educational phase, was stressed.

Mary A. Rozum, instructor and supervising teacher in the sixth grade, represented Illinois State Normal University at a College Night in Watseka on December 3 and at a College Day in Pontiac on February 11. On February 12-13, she attended a regional meeting in Chicago of the Association for Student Teaching.

Elizabeth Russell, assistant professor of education, is chairman of the education committee for the Bloomington-Normal chapter of the American Association of University Women.

Marceil Saller, librarian, had an article published in *Illinois Libraries* for October entitled "The Librarian Meets the Unexpected."

Dr. Theodore Sands, associate professor of social science, attended meetings of the American Historical Association, December 27-29, in Chicago. He discussed "The 'New Look' in Our Foreign Policy" at a meeting of the McLean County Medical Auxiliary, February 9, in Bloomington.

Dr Mary C. Serra, associate professor of education, wrote an article, "Developing Word Recognition and Meaning Vocabulary," which appeared in the December issue of the *Educational Monograph: Corrective Reading in Classroom and Clinic,* No. 79.

Eunice H. Speer, assistant professor and assistant librarian, attended on January 8 a meeting at Springfield of library-science teachers from colleges of Illinois which train for school librarianships at the undergraduate level. She attended mid-winter meetings of the American Library Association in Chicago, February 2-6.

Ethel G. Stein, assistant professor and supervising teacher in the eighth grade, spoke before the Parent-Teacher Association of the Octavia School Unit in Colfax, January 19, on the topic "The Junior High School." On February 12-13 she attended the regional meeting of the Association for Student Teaching at the Congress Hotel in Chicago. She took five Metcalf students to the Young Citizens' meeting in Clinton, December 5, as a project of the Illinois Curriculum Program—Citizenship Education Project.

Dr. Lucy Lucile Tasher, associate professor of social science, attended sessions of the American Historical Association on December 28 in Chicago.

Dr. Lewis R. Toll, professor of business education and director of the division of business education, attended a committee meeting at Charleston, December 17, as chairman of the state committee for the preparation of a business-education curriculum guide for the small schools of Illinois. He attended the convention of the National Business Teachers Association on December 28-30 in St. Louis, Missouri. As vice-president of the National Association of Business Teacher-Training Institutions, he attended the annual convention in Chicago, February 11-13. He talked on "Student Teaching at Illinois State Normal University" in an afternoon program and was chairman of the second general session. Dr. Toll was editor of the January issue of the United Business Education Association *Forum,* a national periodical.